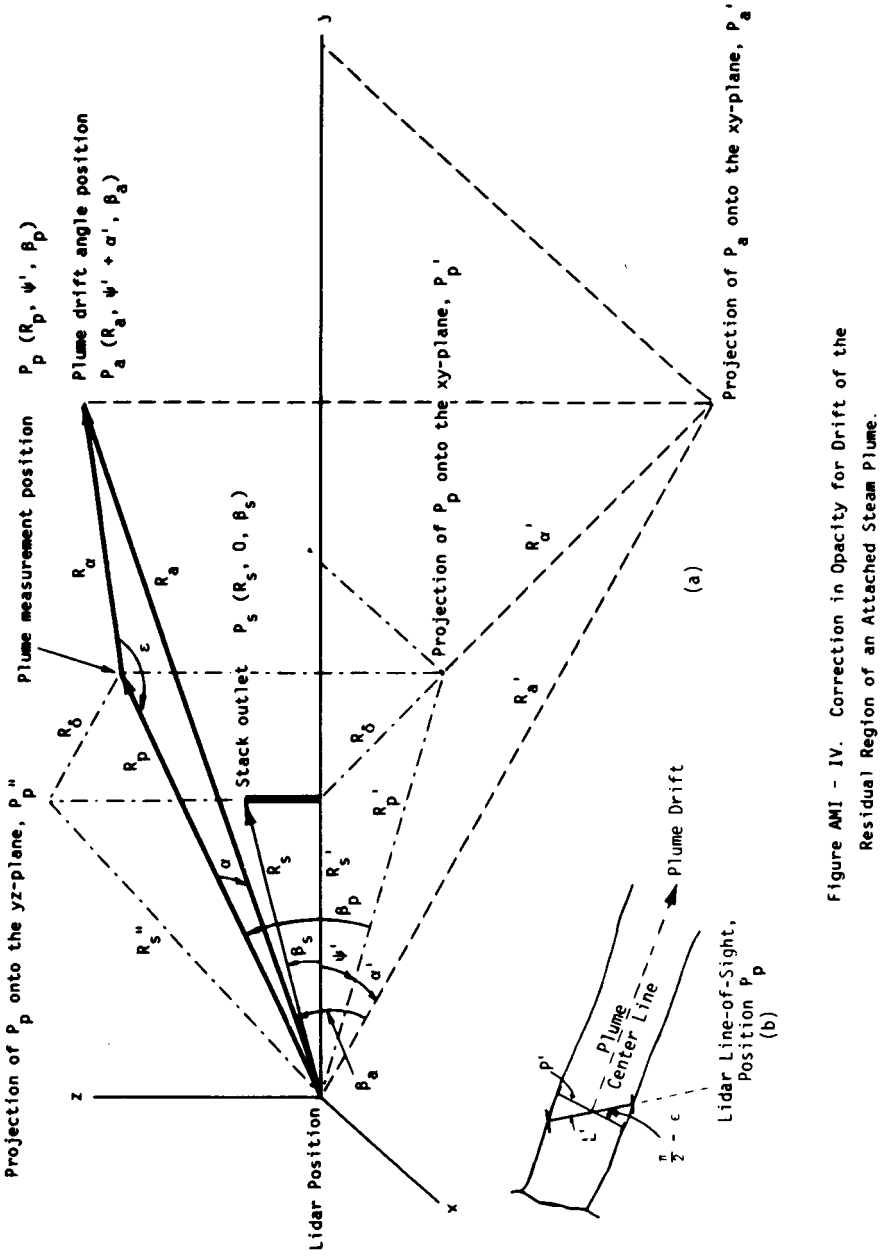

Figure AMI - IV. Correction in Opacity for Drift of the Residual Region of an Attached Steam Plume.

R_s=range from lidar to source*
β_s=elevation angle of R_s*
R_p=range from lidar to plume at the opacity measurement point*
β_p=elevation angle of R_p*
R_a=range from lidar to plume at some arbitrary point, P_a, so the drift angle of the plume can be determined*
β_a=elevation angle of R_a*
α=angle between R_p and R_a
R'_s=projection of R_s in the horizontal plane
R'_p=projection of R_p in the horizontal plane

R'_a=projection of R_a in the horizontal plane
ψ'=angle between R'_s and R'_p* .....
α'=angle between R'_p and R'_a* .....
R≤=distance from the source to the opacity measurement point projected in the horizontal plane .....
Rθ=distance from opacity measurement point P_p to the point in the plume P_a. .....

$$O_{pc} = 1 - (1 - O_p)^{Cos\ (\pi/2-\varepsilon)} = 1 - (1 - O_p)^{Sin\ \varepsilon} \qquad \text{(AMI-8)}$$

The correction angle ε shall be determined using Equation AM1–10.

Where:

$\alpha = Cos^{-1}\ (Cos\beta_p\ Cos\beta_a\ Cos\alpha' + Sin\beta_p\ Sin\beta_a)$,

and

$R\theta = (R_p 2 + R_a 2 - 2\ R_p\ R_a\ Cos\alpha)^{1/2}$

R≤, the distance from the source to the opacity measurement point projected in the horizontal plane, shall be determined using Equation AM1–11.

$$R_\delta = (R'^2_s + R'^2_p - 2R'_s R'_p Cos\psi')^{\frac{1}{2}}, \qquad \text{(AM1-11)}$$

Where:

$R'_s = R_s\ Cos\ \beta_s$, and

$R'_p = R_p\ Cos\ \beta_p$.

In the special case where the plume centerline at the opacity measurement point is horizontal, parallel to the ground, Equation AM1–12 may be used to determine ε instead of Equation AM1–10.

$$\varepsilon = Cos^{-1}\left[\frac{R_p^2 + R_\delta^2 - R''^2_s}{2\ R_p\ R_\delta}\right] \qquad \text{(AM1-12)}$$

Where:

$R''_s = (R'^2_s + R_p^2 Sin^2\beta_p)^{1/2}$.

If the angle ε is such that ε≤ 30° or ε ≥ 150°, the azimuth angle correction shall not be performed and the associated opacity value shall be discarded.

2.6.2 Elevation Angle Correction. An individual lidar-measured opacity, O_p, shall be corrected for elevation angle if the laser elevation or inclination angle, β_p [Figure AM1–V], is greater than or equal to the value calculated in Equation AM1–13.

$$\beta_p \geq Cos^{-1}\left[\frac{ln\ (101 - O_p)}{ln\ (100 - O_p)}\right] \qquad \text{(AM1-13)}$$

The measured opacity, O_p, along the lidar path L, is adjusted to obtain the corrected opacity, O_{pc}, for the actual plume (horizontal) path, P, by using Equation (AM1–14).

*Obtained directly from lidar. These values should be recorded.